## REMARKS

The Office Action mailed 7 June 2010, has been received and its contents carefully noted. The pending claims, claims 1, 2, 4–6, 8–11, 13–22 and 24, were rejected. By this amendment, claim 21 has been amended to alleviate typographical error and claim 25 is newly added. Support may be found in the specification and the claims as originally filed. No statutory new matter has been added. Therefore, reconsideration and entry of the claims as amended are respectfully requested.

**Rejections under 35 U.S.C. 103(a)**

The Examiner rejected claims 1, 2, 4, 5, 8–11, 13–15, 19–22 and 24 under 35 U.S.C. 103(a) as being unpatentable over Toppan Printing Co (JP 2000-106034) in view of Minami. The Examiner rejected claim 6 as being unpatentable over Toppan Printing Co in view of Minami and Asahi (JP 09-291356). The Examiner rejected claims 16–18 as being unpatentable over Toppan Printing Co, in view of Minami and Nippon (JP 2004-127719). Because Toppan Printing Co does not mention anything about the amounts of gallium and indium, the Examiner cited Minami as suggesting in the amounts as set forth in the instant claims. Specifically, the Examiner asserts that Minami discloses GaIn oxides at varying atomic ratios of Ga and In ranging from 0 to 1.0, that the oxides are sputtered at substrate temperatures of room temperature to 350°C to result in amorphous oxides, and that the refractive index of the oxide can be controlled by controlling the amount of gallium.

*Not Amorphous Oxide Films*

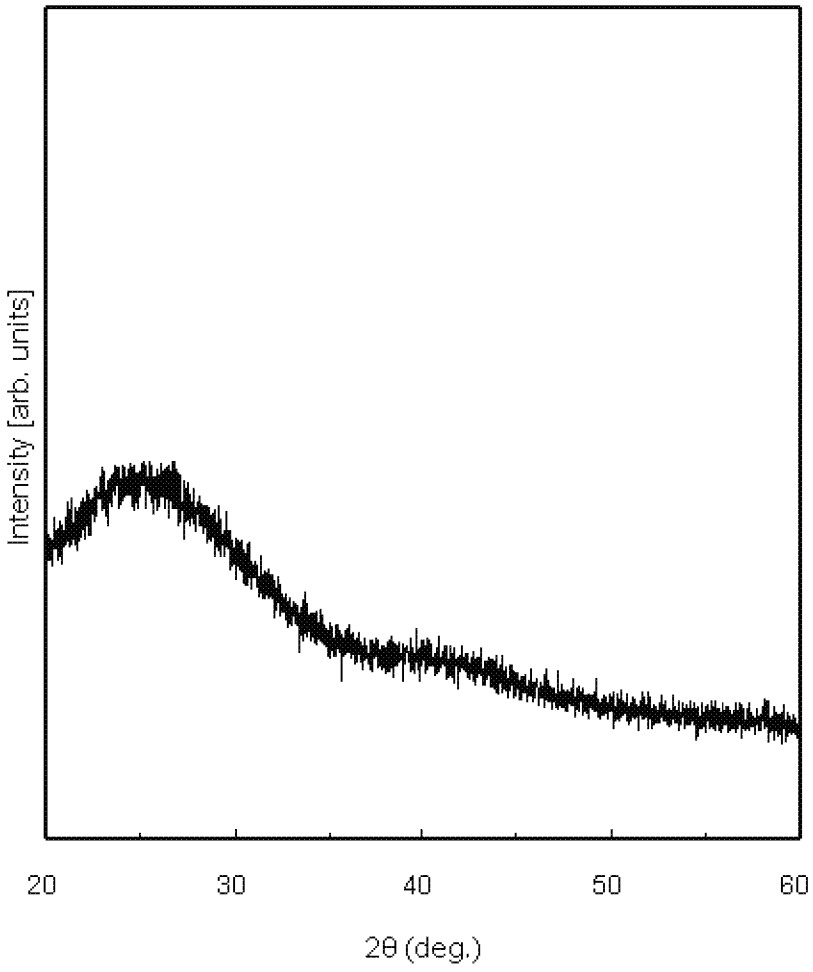
Applicants respectfully submit that Minami does not teach or suggest an "amorphous oxide thin film" according to the instant invention as claimed. Instead, the films of Minami are "crystalline thin films" as evidenced throughout the disclosure of Minami.

First, the abstract of Minami discloses "a resistivity as low as $2.8 \times 10^{-3}$ Ωcm was obtained for $InGaO_3$ films prepared at substrate temperatures of room temperature and 350°C". This means that the prepared $InGaO_3$ film is a crystalline thin film.

Second, Figure 2 on page 1690 of Minami discloses x-ray diffraction profiles for $In_2O_3$-$Ga_2O_3$ films deposited at 350°C using targets with a Ga content ranging from 0.45 to 0.525

atomic ratios of Ga/(Ga + In). When Ga atomic ratios of Ga/(Ga + In) from 0.45 to 0.5, the x-ray diffraction peak appears at a diffraction angle of $2\theta = 52°$ for the $InGaO_3$ phase, which corresponds to the diffraction peak of crystalline $InGaO_3$. This again evidences that the prepared $InGaO_3$ film is a crystalline thin film. When the Ga atomic ratio of Ga/(Ga + In) is at 0.525, the x-ray diffraction peak at a diffraction angle of $2\theta = 52°$ does not appear. However, at a diffraction angle of $2\theta = 30°$ to 35°, a broad x-ray diffraction peak which overlaps 5 or 6 x-ray diffraction peaks of the $InGaO_3$ phase appears. See Fig. 2 of Minami. These diffraction peaks are changed by the Ga atomic ratios, not by the glass substrate. Consequently, when the Ga atomic ratio of Ga/(Ga + In) is at 0.525, the film is a crystalline thin film.

Third, Applicants submit herewith the result of an x-ray diffraction profile experiment using Corning 7059 glass, which is the same substrate as used in Minami. The x-ray diffraction profile below shows an x-ray diffraction peak appearing at a diffraction angle of $2\theta = 20°$ to 30°.



Accordingly, the x-ray diffraction profile of Minami (Fig. 2, page 1690) is not that of the broad diffraction peaks for the substrate, i.e. Corning 7059 glass. This evidences that the atomic structure of the film of Minami is not the same as that of the amorphous film according to the instant invention as claimed.

Thus, it is clear that the disclosure of Minami only relates to a crystalline thin film consisting of an $InGaO_3$ phase – not an amorphous oxide thin film according to the present invention as claimed.

Further, Applicants respectfully submit that modifying the disclosure of Minami to result in a three layer film will not result in the instant invention as claimed. Specifically, Minami discloses (Fig. 5, page 1691) optical transmission spectra for an $InGaO_3$ film (prepared using targets with a Ga content of 0.5), an $In_2O_3$ film, and a $Ga_2O_3$ film. As set forth in Fig. 5, the optical transmission spectra for the $InGaO_3$ film and the $In_2O_3$ film (curve (a), (b) and (c)) are almost the same and all absorbed light with a wavelength of 400 nm or less. In addition, it is noted that transmittance of light with a wavelength of 380 nm is an important feature of the present invention. For the films of Minami, the transmittance of light with a wavelength of 380 nm is 70% or less, a wavelength of 320 nm is 10% or less, and a wavelength of 300 nm is 0%. Thus, a three layer film using the above-referenced $InGaO_3$ films of Minami will result in a film having a transmittance of light with a wavelength of 380 nm that is not over 80%.

However, the three layer film according to the present invention exhibits a transmittance of light with a wavelength of 380 nm that is 88.5% or more, a wavelength of 320 nm that is 58.4% or more, and a wavelength of 300 nm that is 37.4% or more. Additionally, it should be noted that although embodiments 12 and 18, as set forth in the instant specification, have a Ga content of 48% which is near the Ga content of 0.5 according to Minami, the films of embodiments 12 and 18 exhibit a much higher transmittance of light than that of Minami. Therefore, it is clear that there is a substantial difference, with respect to optical properties, between the claimed films and those of Minami in error as such the films of Minami are not amorphous oxide films according to the present invention.

*Routine Optimization Will Not Result in the Claimed Invention*

The Examiner alleges that it would have been obvious to have adjusted the relative amount of Ga and In in the transparent oxide film, as taught by Minami, in order to achieve the exact refractive index that is necessary to provide the higher transmittance called for in Toppan Printing Co. Applicants respectfully traverse this assertion by the Examiner.

First, the refractive index as discussed by Minami is a function of the Ga/(Ga + In) atomic ratio and the refractive index is at wavelengths between 500 nm to 700 nm. See Fig. 6, page 1691. Thus, Minami does not teach or suggest any refractive index values in the visible region of short wavelengths, i.e. 300 nm to 400 nm, in accordance with the present invention.

Second, although Minami discloses optical transmission spectra for an $InGaO_3$ film, an $In_2O_3$ film and a $Ga_2O_3$ film (see Fig. 5, page 1691), the optical transmission spectra is for a Ga content of 50 at.%. Minami does not teach or suggest any optical transmission spectra for films having a Ga content of 62 at.% or more as set forth in the instant claims.

Because Minami does not teach or suggest any refractive index values in the wavelength range of 300 nm to 400 nm and does not teach or suggest any transmittance data for films having a Ga content of 62 at.% or more, Minami cannot possibly teach or suggest any relationship between the wavelength and the refractive index and transmittance which would lead one of ordinary skill in the art to the instant invention as claimed – an amorphous oxide thin film having an gallium content of at least 62 at.%.

In addition, even if one of ordinary skill in the art would have been motivated to attempt to optimize the transmittance of the films of Minami, routine optimization would not have led to the instant invention as claimed. Specifically, the Ga/(Ga + In) atomic ratios and the refractive index values as disclosed in Minami at Fig. 6, page 1691, are proportionally related, i.e. the refractive index gradually decreases as the Ga content is increased. However, according to the claimed invention and as exemplified in embodiments 13 to 17 and embodiments 19 to 23, the transmittance of light at a wavelength of 380 nm and the Ga/(Ga + In) atomic ratio are not proportionally related. Therefore, Applicants respectfully submit that it would have been impossible to optimize the films of Minami to give films having a Ga content of 62 at.% or more in accordance with the present invention.

Further, since the $InGaO_3$ phase of Minami is clearly a crystalline thin film, the optical

properties indium gallium crystalline thin films and indium gallium amorphous thin films are substantially different, and there is nothing in Minami which teaches or suggests that changing the same variable in both type of films will lead to the same or substantially similar impact on the optical properties, one of ordinary skill in the art would not have any reasonable expectation that the optimization parameters for indium gallium crystalline thin films would likely work for indium gallium amorphous thin films.

Applicants respectfully submit that the disclosures of Asahi and Nippon do not alleviate the deficiencies of Toppan Printing Co and Minami. Specifically, none of the cited documents teach or suggest an amorphous oxide film comprising gallium and indium with a gallium content of at least 62 at.%, refractive index values for wavelengths between 500 and 700 nm, and/or any relationship between the refractive index in the transmittance. Thus, the cited documents do not teach or suggest the claimed invention or its unexpected advantages, e.g. a layered film which provides higher transmittance in the visible region of short wavelengths and the ultraviolet region as set forth in the instant claims.

Therefore, Applicants respectfully submit that the rejections under 35 U.S.C. 103(a) should properly be withdrawn.

**Request for Interview**

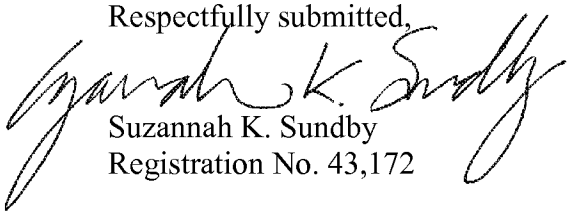
Either a telephonic or an in-person interview is respectfully requested should there be any remaining issues.

## CONCLUSION

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Official action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefor are hereby authorized to be charged to **Deposit Account No. 024300, Attorney Docket No. 034145.004**.

Respectfully submitted,



Suzannah K. Sundby
Registration No. 43,172

Date: 4 November 2010
SMITH, GAMBRELL & RUSSELL, LLP
1130 Connecticut Ave., NW, #1130
Washington, D.C. 20036
Telephone: (202) 263-4332
Fax: (202) 263-4352
ssundby@sgrlaw.com